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**United States
Department of
Agriculture**

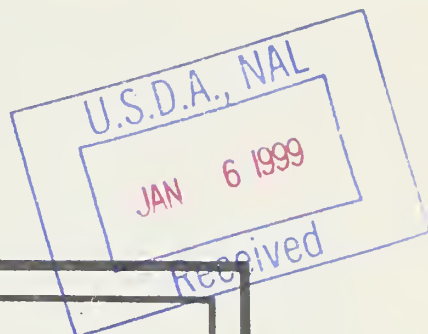


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**UNITED STATES
STANDARDS**
for grades of
**FROZEN
CONCENTRATED
ORANGE JUICE**



EFFECTIVE SEPTEMBER 21, 1968

Fourth Issue
As Amended

These standards supersede the standards
which have been in effect since
January 22, 1966

This is the fourth issue of the United States Standards for Grades of Frozen Concentrated Orange Juice as amended.

These standards were published in the Federal Register on September 4, 1964 (29 F.R. 12575), to become effective on October 19, 1964. Section 52.1589 was amended to change the maximum Brix-acid ratio from 18:1 to 19.5:1 (31 F.R. 880 January 22, 1968).

The standards amended in 1968 (33 F.R. 11881, August 22, 1968) raise the oil limits (Section 52.1588) and change the method for the determination of recoverable oil (Section 52.1590).

This grade standard is issued under authority of the Agricultural Marketing Act of 1946 which provides for the issuance of official U.S. grades to designate different levels of quality for the voluntary use of producers, buyers, and consumers. Official grading service is also provided under this Act upon request of the applicant and upon payment of a fee to cover the cost of the service.

As is the case of other standards for processed fruits and vegetables, these standards are designed to serve as a convenient basis for sales, for establishing quality control programs, and for determining loan values. They will also serve as a basis for the inspection of this commodity by Federal inspection service, which is available for the inspection of other processed products as well.

These standards are issued by the Department after careful consideration of all data and views submitted and the Department welcomes suggestions which might aid in improving these standards in future revisions. Comments may be submitted to, and copies of these standards obtained from:

Chief, Processed Products Standardization and Inspection Branch
Fruit and Vegetable Division, C&MS
U.S. Department of Agriculture
Washington, D. C. 20250

UNITED STATES STANDARDS FOR GRADES OF FROZEN CONCENTRATED ORANGE JUICE

Effective September 21, 1968

PRODUCT DESCRIPTION, STYLES, GRADES

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- 52.1591 Ascertaining the grade of a lot.

SCORE SHEET

- 52.1592 Score sheet for frozen concentrated orange juice.

AUTHORITY: The provisions of this subpart issued under secs. 202-208, 60 Stat. 1087, as amended; 7 U.S.C. 1621-1627.

PRODUCT DESCRIPTION, STYLES, GRADES

§ 52.1581 Product description.

Frozen concentrated orange juice (or frozen orange juice concentrate) is the product as defined in the standards of identity (28 F.R. 10900, 21 CFR 27.109) issued pursuant to the Federal Food, Drug, and Cosmetic Act.

§ 52.1582 Styles.

(a) *Without sweetener.* The Brix value of the finished concentrate is not less than 41.8 degrees and shall be such that when reconstituted according to

NOTE:

Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act or with applicable State laws and regulations.

directions, the reconstituted juice tests not less than 11.8 degrees Brix.

(b) *With sweetener.* The Brix value of the finished concentrate is not less than 42.0 degrees and shall be such that, when diluted according to directions, the reconstituted juice contains not less than 11.8 percent, by weight, of soluble orange solids.

§ 52.1583 Grades.

(a) "U.S. Grade A" (or "U.S. Fancy") is the quality of frozen concentrated orange juice that reconstitutes properly and of which the reconstituted juice: (1) Has an appearance similar to that of fresh orange juice, (2) has a very good color, (3) is practically free from defects, (4) possesses a very good flavor, and (5) scores not less than 90 points when scored in accordance with the scoring system outlined in this subpart.

(b) "U.S. Grade B" (or "U.S. Choice") is the quality of frozen concentrated orange juice that reconstitutes properly, and of which the reconstituted juice: (1) Has a good color, (2) is reasonably free from defects, (3) possesses a good flavor, and (4) scores not less than 80 points when scored in accordance with the scoring system outline in this subpart.

(c) "Substandard" is the quality of frozen concentrated orange juice that fails to meet the requirements of U.S. Grade B.

FILL OF CONTAINER

§ 52.1584 Recommended fill of container.

The recommended fill of container is not incorporated in the grades of the finished product since fill of container, as such, is not a factor of quality for the purposes of these grades. It is recommended that the container be as full of frozen concentrated orange juice as practicable without impairment of quality.

FACTORS OF QUALITY

§ 52.1585 Ascertaining the grade of a sample unit.

(a) *General.* The grade of a sample unit of frozen concentrated orange juice is ascertained by considering the faculty of reconstituting properly and the appearance of the reconstituted juice, which are not scored; the ratings for the factors of color, defects, and flavor which are scored; the total score; and the limiting rules which may be applicable.

(b) *Factors rated by score points.* The relative importance of each factor which is scored is expressed numerically on the scale of 100. The maximum number of points that may be given such factors are:

Factors:	Points
Color -----	40
Defects -----	20
Flavor -----	40
Total score-----	100

§ 52.1586 Ascertaining the rating for the factors which are scored.

The essential variations within each factor which is scored are so described that the value may be ascertained for each factor and expressed numerically. The numerical range within each factor which is scored is inclusive (for example, "18 to 20 points" means 18, 19, or 20 points).

§ 52.1587 Color.

(a) *Evaluation of color.* (1) The color of frozen concentrated orange juice is evaluated by comparing the color of the product with the USDA Orange Juice Color Standards so that the standards become points of reference.

(2) Such comparison is made under an artificial light source of approximately 150 candela intensity and having a spectral quality approximating that of daylight under a moderately overcast sky and a color temperature of 7500 degrees Kelvin, ± 200 degrees.

(3) The USDA Orange Juice Color Standards range from yellow-orange to yellow color, with USDA OJ 1 being the most orange color in the series.

(b) *Procedure in evaluating color.* (1) Place the product in a clear glass test tube of 1 inch diameter.

(2) Arrange color standards in a test tube rack or similar device so that light coming from above strikes the standards at a 45 degree angle. The standards are inclined at a 45 degree angle against a neutral grey background. Observe the standards and product at right angles to the tubes.

(3) Classify the juice after inserting the tube of juice where it best fits in the series of color standards. Orange juice differing in color and brightness from the most nearly matching USDA Orange Juice Color Standard is evaluated by considering the amount of difference and its effect on the total appearance of the juice.

(c) *Availability of color standards.* The USDA Orange Juice Color Standards cited in this section are official color standards which may also be applied to other orange juices. Information regarding these color standards, and their availability, may be obtained from:

Processed Products Standardization and Inspection Branch,
Fruit and Vegetable Division,
Agricultural Marketing Service,
U.S. Department of Agriculture,
Washington, D.C., 20250.

(d) (A) *Classification.* Frozen concentrated orange juice of which the reconstituted juice possesses a very good color may be given a score of 36 to 40 points. "Very good color" means a very good yellow to yellow-orange color that is bright and typical of rich-colored fresh orange juice. Frozen concentrated orange juice that meets this criterion may be assigned score points in accordance with the following schedule:

As compared with USDA Orange Juice Color Standards:	Score (points)
Equal to or better than USDA OJ 2_	40
Equal to or better than USDA OJ 3_	39
Much better than USDA OJ 4_	38
Equal to or slightly better than USDA OJ 4_	37
Equal to or better than USDA OJ 5_	36

(e) (B) *Classification.* If the reconstituted juice possesses a good color, a score of 32 to 35 points may be given. Frozen concentrated orange juice that falls into this classification shall not be

graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule). "Good color" means that the color is the yellow to yellow-orange color typical of fresh orange juice which may be dull but is not off color for any reason. Frozen concentrated orange juice that meets this criterion may be assigned score points in accordance with the following schedule:

As compared with USDA Orange Juice Color Standards:	Score (points)
Better than USDA OJ 6 but not as good as USDA OJ 5-----	35
Equal to USDA OJ 6-----	34
Not as good as USDA OJ 6-----	33 or 32

(f) (*SStd.*) *Classification*. If the reconstituted juice fails to meet the requirements of paragraph (e) of this section a score of 0 to 31 points may be given. Frozen concentrated orange juice that falls into this classification shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§ 52.1588 Defects.

(a) *General*. The factor of defects concerns the degree of freedom from small seeds and portions thereof; from discolored specks, white flakes, harmless extraneous material, and other similar defects; from recoverable oil; and from juice sacs and particles of membrane, core, and peel in excess of that normally present in orange juice.

(b) *Definitions*—(1) *Small seeds and portions thereof*. "Small seeds and portions thereof" means seed, whether fully developed or not, and particles of seed that could pass readily through round perforations $\frac{1}{8}$ inch (3.2 mm.) in diameter.

(2) *Recoverable oil*. "Recoverable oil" means oil recoverable by the method outlined in this subpart.

(c) (A) *classification*. Frozen concentrated orange juice of which the reconstituted juice is practically free from defects may be given a score of 18 to 20 points. "Practically free from defects" means that any combination of defects present may no more than slightly detract from the appearance or drinking quality of the juice, and that there may be no more than 0.035 milliliter of recoverable oil per 100 milliliters of the

reconstituted juice.

(d) (B) *classification*. If the reconstituted juice is reasonably free from defects, a score of 16 or 17 points may be given. Frozen concentrated orange juice that falls into this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule). "Reasonably free from defects" means that any combination of defects present may not seriously detract from the appearance or drinking quality of the juice, and that there may be no more than 0.040 milliliter of recoverable oil per 100 milliliters of the reconstituted juice.

(e) (*SStd.*) *Classification*. Frozen concentrated orange juice that fails to meet the requirements of paragraph (d) of this section may be given a score of 0 to 15 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§ 52.1589 Flavor.

(a) (A) *Classification*. Frozen concentrated orange juice of which the reconstituted juice possesses a very good flavor may be given a score of 36 to 40 points. "Very good flavor" means that the flavor is fine, distinct, and similar to that of fresh orange juice. To score in this classification the frozen concentrated orange juice shall meet the following limits for the respective styles; and when produced solely or predominantly from fruit grown in the geographical areas indicated:

	Brix value-acid ratio	
	Minimum	Maximum
(1) Without sweetener style:		
California or Arizona-----	11.5:1	19.5:1
Outside California or Arizona-----	12.5:1	19.5:1
(2) With sweetener style:		
California or Arizona-----	12:1	19.5:1
Outside California or Arizona-----	13:1	19.5:1

(b) (B) *Classification*. If the reconstituted juice possesses a good flavor, a score of 32 to 35 points may be given. Frozen concentrated orange juice that falls into this classification shall not be graded above U.S. Grade B, regardless of the

total score for the product (this is a limiting rule). "Good flavor" means that the flavor is similar to that of fresh orange juice and is free from abnormal flavors and off flavors of any kind.

To score in this classification the frozen concentrated orange juice—irrespective of style or area of production—shall have a Brix value to acid ratio of not less than 10 to 1.

(c) (*SStd.*) *Classification.* If the frozen concentrated orange juice fails to meet the requirements of paragraph (b) of this section, a score of 0 to 31 points may be given. Frozen concentrated orange juice that falls into this classification shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

EXPLANATIONS AND METHODS OF ANALYSES

§ 52.1590 Definitions of terms and methods of analyses.

(a) *Reconstituted juice.* "Reconstituted juice" means the product obtained by thoroughly mixing the concentrate with the amount of water prescribed on the label or other appropriate directions.

(b) *Reconstitutes properly.* "Reconstitutes properly" means that the concentrate goes into solution readily; and that in approximately 250 ml. of the reconstituted juice, after standing four (4) hours at a temperature of not less than 68 degrees Fahrenheit in a clear glass cylinder (approximately 1¼ inches (30 mm.) in diameter), there may be a noticeable separation of suspended matter but any resulting zone of greater clarity shall be definitely turbid and not clear or transparent.

(c) *Acid.* "Acid" means the percent by weight of total acidity, calculated as anhydrous citric acid, in frozen concentrated orange juice. Total acidity is determined by titration with standard sodium hydroxide solution, using phenolphthalein as indicator.

(d) *Brix value.* "Brix value" in frozen

concentrated orange juice is the refractometric sucrose value determined in accordance with the "International Scale of Refractive Indices of Sucrose Solutions" and to which the applicable correction for acid is added (see Table I of this subpart for corrections). The measurement of Brix value is determined on the thawed concentrate in accordance with the refractometric method for sugars and sugar products, outlined in the "Official Methods of Analysis of the Association of Official Agricultural Chemists."

(e) *Brix value-acid ratio.* The Brix value-acid ratio is the ratio of the Brix value of the concentrate in degrees Brix to the grams of anhydrous citric acid per 100 grams of concentrate.

TABLE I—CORRECTIONS FOR OBTAINING BRIX VALUE

Citric acid, anhydrous (percent by weight)	Correction to be added to refractometer sucrose value to obtain degree Brix value	Citric acid, anhydrous (percent by weight)	Correction to be added to refractometer sucrose value to obtain degree Brix value
2.0-----	0.39	3.6-----	0.70
2.2-----	.43	3.8-----	.74
2.4-----	.47	4.0-----	.78
2.6-----	.51	4.2-----	.81
2.8-----	.54	4.4-----	.85
3.0-----	.58	4.6-----	.89
3.2-----	.62	4.8-----	.93
3.4-----	.66	5.0-----	.97

¹ Source: "Refractometric Determination of Soluble Solids in Citrus Juices," by J. W. Stevens and W. E. Baier, from the Analytical Edition of Industrial and Engineering Chemistry, Vol. II. Page 447, August 15 1939.

(f) *Recoverable oil.* "Recoverable oil" is determined by the following method:

METHOD

(1) *Reagents.*

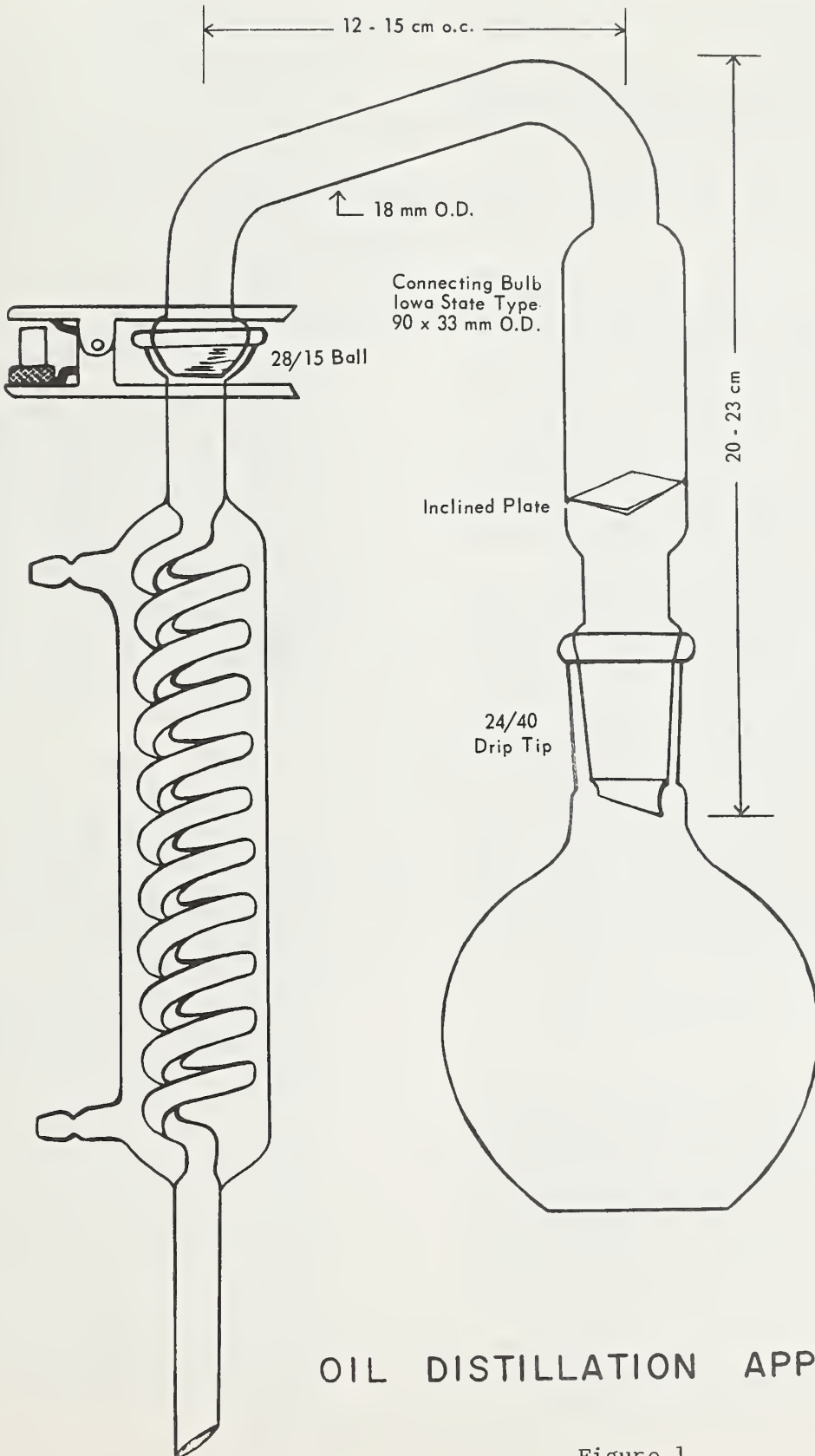
Standard bromide-bromate solution—prepared and standardized to 0.099N in accordance with Chapter 42, Standard Solutions in the current edition of the AOAC.¹ For use, add 1 volume of standard solution to 3 volumes of water to make 0.0247N solution. 1 ml. of 0.0247N solution supplies bromine to react with 0.00085g., or 0.0010 ml., of *d*-limonene. The solutions are stable for 6 months.

2-Propanol—Reagent grade ACS (American Chemical Society).

Dilute hydrochloric acid—prepared by adding 1 volume of concentrated acid to 2 volumes of water.

Methyl orange indicator—0.1 percent in water.

¹ "AOAC" refers to the Official Methods of Analysis published by the Association of Official Analytical (formerly Agricultural) Chemists. Copies may be obtained from this Association at Box 540, Benjamin Franklin Station, Washington, D.C. 20044.



OIL DISTILLATION APPARATUS

Figure 1

(2) *Apparatus.*

Electric heater—with recessed refractory top, 500–750 watts.

Still, all glass—500 ml. distillation flask with 24/40 standard taper neck; 200 mm. Graham condenser with 28/15 receiving socket and drip tip; connecting bulb and adapter as shown in Figure 1.

Burette—10 ml. or 25 ml. graduated to 0.1 ml., with easily controllable flow to permit both rapid and dropwise titration.

(3) *Determination.*

(i) Pipette 25 ml. of well-mixed sample (juice or reconstituted juice) into the distillation flask containing carborundum chips or glass beads, and add 25 ml. of 2-Propanol.

(ii) Distill into a 150 ml. beaker. Continue distilling until solvent ceases to reflux then remove the flask from the heater.

(iii) Add 10 ml. of dilute hydrochloric acid and 1 drop of indicator. (An alternative method would be to prepare a solution containing 5 ml. of indicator and 1,000 ml. of dilute hydrochloric acid—then add 10 ml. of this acid-indicator mix to the 150 ml. beaker.)

(iv) Titrate with the dilute bromate solution while stirring. The major portion of the titrant may be added rapidly, but the endpoint must be approached at about 1 drop per second. Disappearance of color indicates the endpoint.

(v) Determine the reagent blank by titrating three separate mixtures of 25 ml. 2-Propanol and 10 ml. of dilute hydrochloric acid with indicator—without refilling the burette. Divide the total ml. of titrant used by three, to obtain the average blank. Subtract the average blank thus obtained from the ml. of titrant used to titrate the distillate.

(vi) Multiply the remainder by 0.004 to obtain the percent recoverable oil by volume in the juice sample.

LOT COMPLIANCE

§ 52.1591 Ascertaining the grade of a lot.

The grade of a lot of frozen concentrated orange juice covered by these standards is determined by the procedures set forth in the Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products (§§ 52.1 to 52.87).

SCORE SHEET

§ 52.1592 Score sheet for frozen concentrated orange juice.

Size and kind of container.....		
Container mark or identification { Cans.....		
Cases.....		
Label (including ingredient statement, if any).....		
Liquid measure (fluid ounces).....		
Brix value (of concentrate).....		
Style.....		
Total acidity:		
As anhydrous citric, percent by weight.....		
Brix value-acid ratio (:1).....		
Recoverable oil (ml./100 ml.).....		
Reconstitutes properly: (yes) (no).....		
Appearance of juice.....		
<hr/>		
Factors	Score points	
Color.....	40	{ (A) 36-40 (B) 32-35 (SStd.) 10-31
Defects.....	20	{ (A) 18-20 (B) 16-17 (SStd.) 10-15
Flavor.....	40	{ (A) 36-40 (B) 32-35 (SStd.) 10-31
Total score.....	400	
<hr/>		
Grade.....		

¹ Indicates limiting rule.

Effective date. The amendments to each affected standard shall become effective 30 days after publication hereof in the FEDERAL REGISTER.

Dated: August 16, 1968.

G. R. GRANGE,
Deputy Administrator,
Marketing Services.

Published in the Federal Register of September 4, 1964 (29 F.R. 12575)

Section 52.1589 amended January 22, 1966 (31 F.R. 880)

Sections 52.1588 and 52.1590 amended August 22, 1968 (33 F.R. 11881)

EXCERPT FROM TITLE 21 – FOOD AND DRUGS

CHAPTER 1 – FOOD AND DRUG ADMINISTRATION, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Part 27 – Canned Fruits; Definitions and Standards of Identity; Quality; and Fill of Container

§ 27.105 Orange juice; identity.

(a) Orange juice is the unfermented juice obtained from mature oranges of the species *Citrus sinensis*. Seeds (except embryonic seeds and small fragments of seeds that cannot be separated by good manufacturing practice) and excess pulp are removed. The juice may be chilled, but it is not frozen.

(b) The name of the food is "orange juice." The name "orange juice" may be preceded on the label by the varietal name of the oranges used, and if the oranges grew in a single State, the name of such State may be included in the name, as for example, "California Valencia orange juice."

[28 F.R. 10906, Oct. 11, 1963]

*** § 27.109 Frozen concentrated orange juice, frozen orange juice concentrate; identity; label statement of optional ingredients.**

(a) Frozen concentrated orange juice is the food prepared by removing water from the juice of mature oranges as provided in § 27.105, to which juice may be added unfermented juice obtained from mature oranges of the species *Citrus reticulata*, or hybrids thereof, or of *Citrus aurantium*, or both. However, in the unconcentrated blend the volume of juice from *Citrus reticulata* shall not exceed 10 percent and from *Citrus aurantium* shall not exceed 5 percent. The concentrate so obtained is frozen. In its preparation, seeds (except embryonic seeds and small fragments of seeds that cannot be separated by good manufacturing practice) and excess pulp are removed, and a properly prepared water extract of the excess pulp so removed may be added. Orange oil, orange pulp, orange essence (obtained from orange juice), orange juice and other orange juice concentrate as provided in this section or concentrated orange juice for manufacturing provided in § 27.114 (when made from mature oranges), water, and one or more of the optional sweetening ingredients specified in paragraph

(b) of this section may be added to adjust the final composition. The juice of *Citrus reticulata* and *Citrus aurantium*, as permitted by this paragraph, may be added in single strength or concentrated form prior to concentration of the *Citrus sinensis* juice, or in concentrated form during adjustment of the composition of the finished food.

The addition of concentrated juice from *Citrus reticulata* or *Citrus aurantium*, or both, shall not exceed, on a single-strength basis, the 10 percent maximum for *Citrus reticulata* and the 5 percent maximum for *Citrus aurantium* prescribed by this paragraph. Any of the ingredients of the finished concentrate may have been so treated by heat as to reduce substantially the enzymatic activity and the number of viable microorganisms. The finished food is of such concentration that when diluted according to label directions the diluted article will contain not less than 11.8 percent by weight of orange juice soluble solids, exclusive of the solids of any added optional sweetening ingredients. The dilution ratio shall be not less than 3 plus 1. For the purposes of this section and § 27.110, the term "dilution ratio" means the whole number of volumes of water per volume of frozen concentrate required to produce orange juice from concentrate having orange juice soluble solids of not less than 11.8 percent by weight exclusive of the solids of any added optional sweetening ingredients.

(b) The optional sweetening ingredients referred to in paragraph (a) of this section are sugar, sugar sirup, invert sugar, invert sugar sirup, dextrose, corn sirup, dried corn sirup, glucose sirup, and dried glucose sirup.

(c) If one or more of the sweetening ingredients specified in paragraph (b) of this section are added to the frozen concentrated orange juice, the label shall bear the statement "----- added," the blank being filled in with the name or an appropriate combination of names of the sweetening ingredients used. However, for the purpose of this section, the name "sweetener" may be used in lieu of the specific name or names of the sweetening ingredients.

(d) The name of the food concentrated to a dilution ratio of 3 plus 1 is "frozen concentrated orange juice" or "frozen orange juice concentrate." The name of the food concentrated to a dilution ratio greater than 3 plus 1 is "frozen concentrated orange juice, ----- plus 1" or "frozen orange juice concentrate, ----- plus 1," the blank being filled in with the whole number showing the dilution ratio; for example, "frozen orange juice concentrate, 4 plus 1." However, where the label bears directions for making 1 quart of orange juice from concentrate (or multiples of a quart), the blank in the name may be filled in with a mixed number; for example, "frozen orange juice concentrate, $4\frac{1}{2}$ plus 1." For containers larger than 1 pint, the dilution ratio in the name may be replaced by the concentration of orange juice soluble solids in degrees Brix; for example, a 62° Brix concentrate in $3\frac{1}{2}$ -gallon cans may be named on the label "frozen concentrated orange juice, 62° Brix."

(e) Wherever the name of the food appears on the label so conspicuously as to be easily seen under customary conditions of purchase, the statements specified in this section for naming the optional ingredients used shall immediately and conspicuously precede or follow the name of the food, without intervening written, printed, or graphic matter.

(f) Nothing in this section is intended to interfere with the adoption and enforcement by any State, in regulating the production of frozen concentrated orange juice in such State, of State standards, consistent with this section, but which impose higher or more restrictive requirements than those set forth in this section.

* Effective December 29, 1965.

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